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UNITED STATES PATENT APPLICATION

FOR

APPARATUS AND METHOD FOR SEVERING  
OR SEPARATING A WEB

BY

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**Reference to Related Applications**

This application claims priority from previously filed Provisional  
Application No. 60/243,983 which was filed in the United States on  
5 October 27, 2000.

**Title of the Invention**

Apparatus and Method for Separating or Severing a Web

**Background of the Invention**

Products formed from webs, such as tissues, paper towels, and  
10 the like typically are wound upon large supply rolls after manufacture of  
the paper stock. To prepare such rolled products for consumer use, the  
paper must be rewound into smaller sized rolls, placed upon cores, and  
cut, to provide an appropriate sized individual paper product for use.

In conventional systems, a core is placed upon a mandrel that is  
15 capable of spinning. Thus, rotation of the mandrel in conjunction with  
the core may wind the paper upon the core. Techniques for using  
mandrels for winding paper are known in the art. For example, a turret  
style winding system is a known method used to wind paper onto a core.  
Most turret systems include a number of mandrels that each is capable  
20 of spinning independently of each other so that multiple paper logs may  
be formed simultaneously. Then, the logs may be cut into smaller rolls in  
a later step. The cored rolls then are removed from the mandrel.

Some current continuous center-winding systems provide a web

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that is cut by engaging a web cut-off knife from a rotating bedroll. In many such systems, the engaging mechanism actually rotates with the roll, and is mounted inside or upon the roll. The timing and engagement of the knife in current continuous center-winding systems may be adversely affected by increasing centrifugal forces placed upon the mechanism by high rotational speeds of the bedroll.

As manufacturing line-processing speeds continually increase, the adverse affect of increased centrifugal forces upon rotating knife engaging mechanisms has become a significant challenge. The timing, set-up and engagement of such mechanisms are undesirably affected by centrifugal forces upon the relatively delicate mechanical apparatus. Movement of these mechanisms sometimes adversely affects the rotational balance of the bedroll, which may induce undesirable vibration into the winder. This may cause perforations in the tissue to be incorrectly applied or uneven, and may undesirably increase equipment wear.

A need exists for an improved separating apparatus, system, and method for separating webs. Further, a system that is capable of transferring the separated web portions to cores at higher line speeds would be desirable. Further, a severing or separating mechanism that is not adversely affected or rendered inoperable by centrifugal forces acting upon the bedroll would be desirable.

### Summary of the Invention

The invention provides an improved severing apparatus and process for separating or severing running webs. The invention may provide for the separation of the web into an upstream portion and a downstream portion. Subsequently, the downstream portion of the web may be wound into a roll. The invention is not limited to paper webs, but may be employed with essentially any web or sheet material that is to be cut to length in the process of manufacture or rolling. Thus, the web may comprise textiles, fabrics, nonwoven materials, paper, fibrous based web, and others. The invention is particularly useful for applications that include winding a web or sheet material into rolls at high processing speeds.

The invention may include a rotating transfer roll. In some embodiments, the rotating transfer roll may be configured to carry a web on its exterior surface, the rotating transfer roll optionally including a transfer pad. A transfer pad may be adapted for applying a releasable suction force to adhere the web to the transfer roll. A severing device also is provided. The severing device is configured to separate the web into portions. In one aspect of the invention, a severing roll is employed instead of the severing device. The severing roll, when it is used, is configured to separate the web into portions.

### **Brief Description of the Drawings**


A full and enabling disclosure of this invention, including the best mode shown to one of ordinary skill in the art, is set forth in this specification. The following Figures illustrate the invention:

5           Figure 1 reveals a configuration of the invention with a severing device located in close proximity to a vacuum assisted transfer roll;

Figure 2 is a perspective view of the embodiment of Figure 1 a short time after the time shown in Figure 1, in which the transfer pad causes the web to contact the core, and the vacuum source may no longer be applied; and

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Figure 3 shows an alternate configuration of the invention with a severing roll located in close proximity to a vacuum assisted transfer roll.

 Repeated use of reference characters in the present specification and drawings is intended to represent same or analogous features or elements of various embodiments of the invention.

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### **Detailed Description of the Invention**

Reference now will be made to the embodiments of the invention, one or more examples of which are set forth below. Each example is provided by way of explanation of the invention, not as a limitation of the invention. In fact, it will be apparent to those skilled in the art that

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various modifications and variations can be made in this invention without departing from the scope or spirit of the invention. For instance, features illustrated or described as part of one embodiment can be used

on another embodiment to yield a still further embodiment. Thus, it is intended that the present invention cover such modifications and variations as come within the scope of the appended claims and their equivalents. Other objects, features and aspects of the present invention are disclosed in or are obvious from the following detailed description. It is to be understood by one of ordinary skill in the art that the present discussion is a description of exemplary embodiments only, and is not intended as limiting the broader aspects of the present invention, which broader aspects are embodied in the exemplary constructions.

The various embodiments of the invention may be distinguished by several features. Several embodiments of the invention are shown in the drawings, and other embodiments of the invention not shown easily could be realized by persons of skill in the art upon review of this specification. The invention is not limited by the specific embodiments shown in the appended drawings.

In one embodiment of the invention, as shown in Figure 1, a severing device **25** is adapted for engagement with a web **23** and transfer roll **21**. A vacuum space **22** may be located within the transfer roll **21**. Vacuum space **22** applies a low ambient pressure condition or suction force that is communicated through transfer pad **26**, which may be partially embedded in transfer roll **21**. The transfer pad **26** and

the vacuum insert **38** are perforated with vacuum holes or slots (not shown), which are adapted for air circulation that serves to pull the web **23** tightly against its surface. Further, a vacuum insert **38** provides a suction force on the trailing edge, pulling the web **23** against the surface.

5           The vacuum assisted transfer roll **21** transports the leading edge of the web **23** in a rotational path, as shown in the Figure **1**. The severing device **25** may be adapted to separate the web **23** into sections or portions as further discussed below. In one embodiment, the severing device **25** separates the web **23** into a downstream portion **42** and an  
10           upstream portion **43** (see Figure **2**). This separation may be a complete cut, in the case of a web **23** that is not perforated, or can be simply a separation of a web **23** at an existing perforation, such as perforation **24**. The perforations such as perforation **24** typically run along the cross direction of the web **23**, as shown in Figures **1-3**.

15           In the practice of the invention, the leading edge of the web **23** approaches the cored mandrel **28** as the web **23** travels in a circular fashion around the outer edge of the transfer roll **21**. Cored mandrel **28** is shown in Figure **1** ready to receive web **23**, and may have adhesive that has been deposited upon its surface to adhere the leading edge of  
20           the web **23** to the surface of the cored mandrel **28** once the cored mandrel **28** has been rotated into position to receive the web **23**. In other embodiments, vacuum suction forces may hold the tail of the web

23 upon the cored mandrel 28 until the web 23 has begun winding. The latter method sometimes does not need adhesive at all.

The severing device 25 may be comprised of a high-speed air knife, a high-speed water knife, a cut-off knife, or an interference device, as examples.

In some embodiments of the invention, a servo motor may control the motion of severing device 25.

9857 ~~The severing device 25 may be fixed in a non-rotating position in~~  
close proximity to the rotating transfer roll 21. The severing device 25  
may send a component (not shown, such as a blade) or a high speed  
water stream (in the case of a water knife, for example), or a high speed  
air stream (in the case of an air knife, for example) into channel 27 to  
sever the web 23. Then, the transfer pad 38 causes the web 23 to  
contact and adhere to the cored mandrel 28. The vacuum source can  
be disengaged or turned off as shown in Figure 2 to facilitate release  
and winding of the downstream portion 42 of the web 23.

Turret 36 is shown with a central axis 35. Many turret assemblies known in the art are suitable for use in connection with the present invention. Examples of various turret assemblies that may be used in the present invention include, but are not limited to, the turret assemblies described in U.S. Patent Nos. 4,133,495 to Dowd; 5,337,968 to De Bin et al.; and 5,797,559 to Coffey.



In general, the motion of the cored mandrel **28** from the pre-spin position (see cored mandrel **29**) to the transfer position (see winding roll **32**) must be completed during the transfer roll revolution so that the web **28** which is carried upon the surface of the transfer pad **26** does not  
5 contact the incoming cored mandrel **28** prematurely. A complete roll **33** is shown at the next successive mandrel position. Mandrel **30** and mandrel **31** are shown at the next successive positions.

In another embodiment of the invention, there is provided a rotating severing roll **40** to separate the paper web into sections at  
10 periodic intervals. Figure **3** shows like components having the same numerals as shown in Figures **1-2**. However, in the embodiment of the invention as shown in Figure **3**, a rotating severing roll **40** is provided. The embodiment of the invention shown in Figure **3** differs from that shown in Figures **1-2**. The severing roll **40** rotates, and is timed to sever  
15 the web **23** at precisely the correct moment to create a downstream portion of web **23** of appropriate length for winding on winding roll **32**.

The timing between the transfer roll **21**, the application of the suction force or vacuum, the leading edge of the web **23**, and the mandrels of turret **36** may be monitored and controlled by an electronic  
20 position sensing and control system. Such a system is generally known to persons of skill in the art. Further, the timing of the vacuum onset and vacuum release may be adjusted relative to the position of the transfer

roll 21 by moving a vacuum shoe (not shown) which is provided at the transfer roll 21.

It is understood by one of ordinary skill in the art that the present discussion is a description of exemplary embodiments only, and is not intended as limiting the broader aspects of the present invention, which  
5 broader aspects are embodied in the exemplary constructions. The invention is shown by example in the appended claims.

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